J Immigrant Minority Health (2010) 12:909–914
DOI 10.1007/s10903-010-9354-4

ORIGINAL PAPER

Prevalence and Associated Factors for *Chlamydia trachomatis* Infection Among Undocumented Immigrants in a Primary Care Facility in Geneva, Switzerland: A Cross-Sectional Study

Yves Jackson · Paul Sebo · Gaelle Aeby · Patrick Bovier · Beatrice Ninet · Jacques Schrenzel · Philippe Sudre · Dagmar Haller · Jean-Michel Gaspoz · Hans Wolff

Published online: 20 May 2010

Abstract *Chlamydia trachomatis* infection (CTI) is the most frequent sexually transmitted infection in western countries. Its prevalence in undocumented immigrants, a rapidly growing vulnerable population, remains unknown. We aimed to document the prevalence of CTI and associated factors at the primary health care level. This cross-sectional study included all undocumented immigrants attending a health care facility in Geneva, Switzerland. Participants completed a questionnaire and were tested for CTI by PCR assay. Three-hundred thirteen undocumented immigrants (68.4% female, mean age 32.4 (SD 8) years) agreed to participate. CTI prevalence was 5.8% (95% CI 3.3–8.4). Factors associated with higher prevalence were age ≤25 (OR 3.9, 95% CI 1.3–12.2) and having had two or more sexual partners during the precedent year (OR 4.5, 95% CI 1.5–13.7). Prevalence and associated factors for infection in this vulnerable population were comparable with other populations in Western countries. Our findings support the importance of facilitating access to existing screening opportunities in particular to individuals at higher risk.

Keywords *Chlamydia trachomatis* · Sexually transmitted infection · Undocumented immigrants

Y. Jackson (✉) · P. Sebo · G. Aeby · P. Bovier · D. Haller · J.-M. Gaspoz · H. Wolff
Department of Community Medicine and Primary Care, Geneva University Hospitals, Rue Gabrielle-Perret-Gentil 4, 1211 Geneva 14, Switzerland
e-mail: yves.jackson@hcuge.ch

Y. Jackson · P. Sebo · G. Aeby · P. Bovier · B. Ninet · J. Schrenzel · D. Haller · J.-M. Gaspoz · H. Wolff
Faculty of Medicine, University of Geneva, Geneva, Switzerland

B. Ninet · J. Schrenzel
Department of Internal Medicine, Service of Infectious Diseases, Geneva University Hospitals, Geneva, Switzerland

P. Sudre
Department of Economy and Health, General Directorate of Health, Geneva Canton, Switzerland

Background

Geneva (Switzerland) hosts an estimated 8,000–12,000 undocumented immigrants (immigrants without residency permit), representing 1.8–2.8% of the 434,500 resident population [1]. More generally, undocumented immigrants represent a rapidly growing population in Europe and North America. Most of them left their home country because of poor economic conditions in search of better opportunities in Europe. They usually live in very precarious conditions in Geneva.

Chlamydia trachomatis infection (CTI) is the most frequently diagnosed bacterial agent of sexually transmitted infections in both men and women in the Western world. In the USA, the prevalence in the general population ranges between 1 and 5% [2]. In Switzerland, CTI reporting is mandatory in the general population. Paget et al. [3] found 2.8% prevalence in asymptomatic sexually active women attending private gynaecology and antenatal clinics in 1998 but estimated that the exact burden of this infection remains unknown as an important proportion of CTI is not diagnosed and reported. The number of cases notified countrywide increased from 3,493 in 2003 to 6,178 in 2008 and from 439 to 712 in the canton of Geneva [4].

Most cases of infection remain undiagnosed, thus many individuals remain at risk of developing complications and of infecting others. Risk of infection depends on demography and behaviour. Women under the age of 25,

non-white individuals and people with new or multiple sex partners are considered at increased risk in the US [2]. On the basis of studies showing a significant reduction in poor health outcomes following treatment of positive cases, American and British recommendations favour screening of all asymptomatic sexually active and or pregnant women at increased risk [2–5]. Few studies have assessed the role of socio-economic status or immigration as risk factors for CTI and these factors are not formally recognised as indicators for systematic screening. Undocumented immigrants represent a particularly vulnerable group of population because of financial constraints, poor access to care and more risk for abuse. To the best of our knowledge, only two studies specifically addressed CTI prevalence in undocumented immigrants. Wong et al. [6] found a CTI prevalence of 3.5% in 198 very precarious Latino immigrant day workers in San Francisco. Wolff et al. [7] investigated 175 undocumented pregnant women undergoing early termination of pregnancy in Geneva and found a 13% CTI prevalence. Improving our understanding of disease in vulnerable populations is critical to improving services designed to reduce prevalence.

The aim of this study was to measure the prevalence of CTI and assess factors associated with infection in a sequential sample of undocumented immigrants without health insurance living in Geneva, in order to estimate the need to develop specific CTI screening programs in this population.

Methods

Setting

This cross-sectional study took place in Geneva's Community Mobile Care Unit. This is a unique health care facility in the region, created in 1996 within the Department of Community Medicine of Geneva University Hospitals. The facility is dedicated to providing easy and affordable access to primary care for uninsured and/or economically deprived adults based on a culturally-sensitive and non-stigmatizing approaches. Around 3,200 immigrants with variable situation regarding residency permit and health insurance attend the facility each year through its walk-in clinic.

Most undocumented immigrants without health insurance attending the clinic are female coming from Latin America and working in the domestic industry. Their average monthly income is less than 800 US dollars, which is around 50% below the poverty threshold in Switzerland [8]. Gynaecological and obstetrical problems are frequent, including an important demand for prenatal care and for voluntary termination of pregnancy [7, 9, 10].

Participants and Procedure

Undocumented immigrants attending the Community Mobile Care Unit from November 2007 to February 2008 were offered the opportunity to participate following informed consent. Participants completed a questionnaire about their socio-demographic profile and sexual behaviour and provided a urine sample. Confidentiality was ensured by asking participants to complete the questionnaire in a separate room. Inclusion criteria were capacity for providing formal consent, age between 18 and 50, no legal residence permit nor health insurance and absence of specific antibiotic treatment for CTI in the last 3 months. Questionnaires were available in French, English, Spanish and Portuguese; a multilingual (French, Spanish, Portuguese) investigator was always available on site to help complete the questionnaire. Questionnaires had been translated by bilingual physicians and pre-tested in all four languages on a total of 20 patients. First-void urine samples were collected at the time the questionnaire was completed, kept refrigerated in the Unit and tested at the Geneva University Hospitals within 15 days. Participants received no incentive for their participation.

Chlamydia Testing

Real-time PCR detection for CTI was performed with the Abbott CT/NG reagents on an *m*2000 platform (Abbott Molecular Diagnostics, Des Plaines, IL; Marshall and al 2007). This assay is designed to detect the cryptic plasmid of *C. trachomatis*; the interpretation of the results was made according to the CE (European Conformity) package

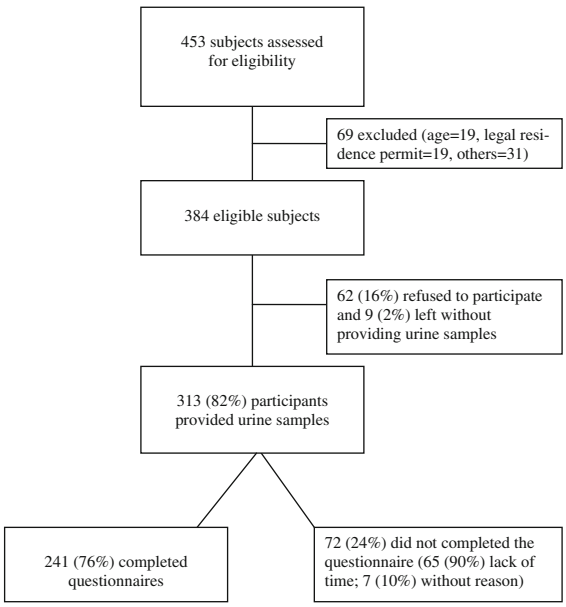

Fig. 1 Flow diagram of study participants ($n = 453$)

insert. All specimens that gave positive results were confirmed by a second analysis of the same urine sample. Confirmed positive cases were contacted by phone by the study nurse in order to provide them with treatment by a single dose of azithromycin 1 g orally, after a pregnancy was excluded by a negative urine βHCG test. They were given a similar single-dose treatment for their partner(s), when identifiable.

Statistical Analysis

In order to investigate the relationship between CTI and possible associated factors, we used 2×2 tables and performed Chi-square and Fisher's exact tests for categorical variables and unpaired Student's *t*-tests for continuous variables. Univariate and multivariate logistic regression analysis were used to assess factors associated with CTI. Significant risk factors of univariate analysis ($P > 0.05$) were included in the multivariate model except sex, which was kept in each model. All analyses were performed using SPSS for Windows (version 15.0).

Missing Data

All undocumented immigrants who gave a urine sample were included in the study. CTI prevalence in those who did not reply to the questionnaire was compared to those for whom a complete data set was available.

Ethical Considerations

All undocumented immigrants gave written consent. The study was approved by the ethical research committee of the Geneva University Hospitals.

Results

Of 453 adults assessed for eligibility, 313 (69%) persons were included in the study after providing a urine sample (Fig. 1). The 62 individuals who refused to participate did not differ from participants in terms of age, sex and origin. No significant difference was observed between participants completing the questionnaire or not concerning age in those who completed the questionnaire and in those who didn't (32.6 (SD 8.0) respectively 31.4 (SD 7.9); ($P = 0.24$), and CTI prevalence (6.2% respectively 4.2%; $P = 0.37$).

Socio-Demographic Characteristics

Mean age of the participants was 32.4 years (standard deviation (SD) 8.0, range: 18–50). 68.4% of the subjects were female and 78.3% originated from South and Central America: Bolivia (40.7%), Brazil (21.2%), Ecuador (7.9%), Colombia (7.5%), Chile (2.5%), Paraguay (2.1%), Peru (0.3%), Honduras (0.8%), Nicaragua (0.8%), Argentina and Haiti (0.3% each). 13.1% of participants came from Africa, 4.5% from Asia and 4.1% from Europe. None had a valid health insurance. 52.1% were single, others were married (27.7%), divorced (9.7%), separated (8.8%) or widowed (1.7%). 72% were currently working, mostly in very low-wage jobs and 66.4% had a post obligatory or higher educational level.

Health Related Aspects

Self-rated health status was the following: poor (24.9%), fair (49.2%) and good or very good (25.9%). 32% of the participants had used antibiotics during the last 3 months. At the time of screening, 1.3% of men and 10.9% of women reported urinary tract symptoms, 22.7% of the latter had recently noticed vaginal discharge.

Chlamydia trachomatis Infection (CTI)

CTI was found in 18 of 313 subjects (5.8%, 95% CI 3.2–8.3). Table 1 shows relevant characteristics of study subjects with and without CTI. Significant differences were found concerning age and the number of sexual partner during the year prior to the study. Among those who had CTI, prevalence was higher in women compared to men but this difference was not significant (6.5% vs. 4.0%; $P = 0.27$; Tables 1, 2). Being female, unmarried, of Central and South American origin, low educated and using antibiotics during the last 3 months was not associated with a significantly increased risk of being infected. Multivariate analyses showed that young undocumented immigrants ($\leq$25 versus >25 years) had a 4 times higher risk of CTI (adjusted OR 3.9; 95% CI 1.3–12.2). Individuals who had had 2 or more partners during the last year had a 4–5 times higher risk for CTI (adjusted OR 4.5; 95% CI 1.5–13.7) compared to those with no or one sexual partner.

Clinical Follow-Up

All CTI patients, except one, could be contacted by phone, which frequently necessitated repeated calls. All but one contacted positive cases received treatment for themselves and their partners. No side-effects were reported.

Discussion

This study showed CTI prevalence in undocumented immigrants of 5.8% with higher risk in those younger than

Table 1 Description of study subjects with and without *C. trachomatis* infection in undocumented immigrants, Geneva, Switzerland

	Subjects with *C. trachomatis* Mean (SD) or *n* (%)	N in analysis[a]	Subjects without *C. trachomatis* Mean (SD) or *n* (%)	N in analysis[b]	*P*
Age	25.4 (4.7)	18	32.8 (8.0)	295	<0.0001
Gender (female)	14 (78%)	18	200 (68%)	295	0.27
Civil status					0.31
Unmarried	13 (81%)	16	160 (72%)	223	
Married	3 (19%)	16	63 (28%)	223	
Latin American origin	16 (89%)	18	229 (78%)	295	0.21
Education					0.08
<Post-obligatory	8 (53%)	15	70 (32%)	221	
Post-obligatory	7 (47%)	15	151 (68%)	221	
Antibiotic ≤3 months	5 (33%)	15	72 (32%)	226	0.96
Uro-genital complaints					0.11
Present	8 (73%)	11	87 (49%)	179	
Absent	3 (27%)	11	92 (51%)	179	
Sexual partner(s) in last year (*n*)	1.1 (0.5)	15	1.5 (0.6)	220	0.017

[a] Total number of study subjects with CTI available for subgroup analysis

[b] Total number of study subjects without CTI available for subgroup analysis

Table 2 Frequencies of associated factors and unadjusted and adjusted odds ratios (OR) of *C. trachomatis* infection in undocumented immigrants, Geneva, Switzerland

	Prevalence of *C. trachomatis n* (%)	Unadjusted OR for CTI (95% CI)	Adjusted OR for CTI[a] (95% CI)
Age			
≤25 years ($n = 66$)	10/66 (15.2%)	5.3 (2.0–14.1)	3.9 (1.3–12.2)
>25 years ($n = 247$)	8/247 (3.2%)		
Gender			
Women	14/214 (6.5%)	1.7 (0.5–5.2)	2.3 (0.6–9.5)
Men	4/99 (4.0%)		
Civil status			
Unmarried	13/173 (7.5%)	1.6 (0.4–5.8)	
Married	3/66 (4.5%)		
Origin			
Latin America	16/245 (6.5%)	2.3 (0.5–10.3)	
Other	2/68 (2.9%)		
Post-obligatory education			
Without	8/78 (10.3%)	2.8 (0.9–8.4)	
With	7/158 (4.4%)		
Antibiotic ≤3 months			
Yes	5/77 (6.5%)	1.07 (0.35–3.2)	
No	10/164 (6.1%)		
Uro-genital complaints			
Yes	8/95 (8.4%)	2.8 (0.7–11.0)	
No	3/95 (3.2%)		
Sexual partners in last year			
≥2 ($n = 53$)	8 (15.1%)	4.4 (1.5–12.9)	4.5 (1.5–13.7)
<2 ($n = 182$)	7 (3.8)		

[a] Adjustment for relevant associated factors: age, gender, number of partners the last year

25 years old and/or those who reported having had ≥2 sexual partners the year prior to the study. Prevalence of infection in those presenting one of these risk factors was very high (15%). The prevalence of CTI in our study was slightly higher than previously reported in the general population in Western countries, where prevalences between 1 and 5% were found [2, 3, 5, 11]. In Europe, a report estimated global CTI prevalence of 3.4% in asymptomatic women [12]. Yet, even if populations samples and recruitment locations were not comparable, we believe that our data did not show a clinically significant difference compared to recently published data.

The factors associated with CTI in this study (age <25 years and ≥2 sexual partners in the preceding year) have previously been shown to be associated with CTI prevalence as high as 10% [13, 14]. Studies in different settings have found that having multiple partners increased the risk of infection as compared with having a single partner [13–15]. On the other hand, we found that unmarried subjects did not have an increased risk for CTI, which contradicts previous studies [15]. This difference could be explained by the fact that the majority of undocumented immigrants live separated from their husband/wife, thus potentially narrowing the difference in relation to marital status in terms of CTI risk.

The self-administered questionnaire revealed a rather low perception of self-rated health status and a high frequency of antibiotic use (32%) in the 3 months preceding the study. As antibiotics name and dosage were not defined, it was not possible to assess the exact impact on CTI prevalence. Prevalence in antibiotic users and non users did not, however, differ significantly. This frequent use of antibiotic among immigrants in Geneva has already been described and related to widely practiced self-prescription (usually medicines bought or sent from the country of origin) [16].

Social and demographic factors have been associated with the risk of acquiring CTI. Studies have shown that being non-white and having a lower educational level significantly increased the risk of infection [13, 14, 17, 18]. Still, data on CTI prevalence in economically deprived immigrants are scarce. A study in a mainly Hispanic community in Washington showed prevalence of 5.4%. In Amsterdam, Van den Hoek et al. showed a higher prevalence in female immigrants from Surinam (4.9%) compared to the general population (4.2%) [19, 20]. Several social aspects could explain the increased prevalence found in our cohort of undocumented immigrants. First, this population included mostly young sexually-active females, which were at increased risk for CTI. Secondly, poor access to health care means less CTI detection and screening, thus an increased risk of transmission. Recent studies have shown insufficient knowledge and practice concerning family planning and adequate contraceptive use among undocumented immigrants in Geneva [9, 10].

This study has strength in that it presents original data on CTI prevalence and associated factors in a poorly studied but rapidly growing population in Europe. The high participation rate, despite the sensitive topic, adds value to the reported results. This study showed that research on undocumented immigrants was possible through migrant-friendly health care facilities. Community-based, culturally-sensitive approaches and non-stigmatizing attitudes favoured acceptance and participation in the study. Similar strategies have already been shown to be efficient elsewhere [21].

Limitations of our study included the relatively small sample size and the predominance of Central and South American undocumented immigrants. Our results reflect the situation among a very vulnerable urban population in a Western European country. Considering the social and economical specificities of this population, we cannot generalize our results to the whole resident population. Nevertheless, several aspects led us to believe that this study reached a substantial and representative proportion of undocumented immigrants in Geneva and consequently that our results can be generalized to other urban areas with high number of Latino Americans undocumented immigrants: (1) The Geneva University health care facility for undocumented immigrants is well known and widely used by this hard-to-reach population; (2) The proportion of Central and South American undocumented immigrants (78%) was similar to that found by the Geneva Trade Union that recently found 76% of undocumented workers in Geneva were Latin Americans [22]. Recruitment within a health clinic may have biased our sample towards less healthy individuals, as illustrated by the perceived low level of health reported by participants. Yet, care must be taken when evaluating the overall bad health perception in a mostly Latino American population. This may actually reflect more acculturation and other factors rather than real health conditions as shown in a survey in Los Angeles [23].

Furthermore, we had to deal with a substantial number of missing values which was mainly explained by the 72 unfilled the questionnaire concerning potential risk factors. Still, no significant difference concerning CTI prevalence was observed between responders and non-responders.

In addition, comparable CTI prevalences were found in surveys performed in Central and South America [24, 25]. The high number of subjects reporting recent antibiotic use before the study may have represented another limitation because of its potential impact on CTI prevalence.

More studies are needed in different settings and with different groups to develop a more global view on CTI prevalence in this particularly vulnerable population.

New Contribution to the Literature

Our findings do not call for the implementation of specific screening program targeting undocumented immigrants in Geneva but rather stress the importance of ensuring CTI screening are accessible to this particularly vulnerable population and in particular to individuals at higher risk.

Acknowledgments The authors would like to thank Marylise Holst, Odile Colombel-Musset, Heidi Fowler-Njie, Martine Locatelli, Tina Mazzocato, Edith Meriaux, for their precious collaboration and support. This study was supported by institutional grants from the Geneva University Hospitals (R&D fund) and from the Department of Health and Community Medicine, University of Geneva and the General directorate of health, Department of economy and health, Geneva Canton.

References

1. Longchamp C et al. Sans-papiers en Suisse: c'est le marché de l'emploi qui est déterminant, non pas la politique d'asile. Rapport final sur mandat de l'office fédéral des migrations; gfs Bern 2005. 2005. Available at http://www.gfsbern.ch/pub/sans-papiers.pdf. Accessed 3 June 2009.
2. Screening for chlamydial infection: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2007;147(2):128–34.
3. Paget WJ, et al. National laboratory reports of *Chlamydia trachomatis* seriously underestimate the frequency of genital chlamydial infections among women in Switzerland. Sex Transm Dis. 2002;29(11):715–20.
4. Swiss Federal Office of Public Health. National report for infectious diseases. 2009. Available at: http://www.bag.admin.ch/k_m_meldesystem/00733/00804/index.html?lang=fr. Accessed 3 June 2009.
5. Pimenta JM, et al. Evidence based health policy report. Screening for genital chlamydial infection. BMJ. 2000;321(7261):629–31.
6. Wong W, et al. Prevalence of sexually transmitted diseases among Latino migrant day laborers in an urban setting—San Francisco. Sex Transm Dis. 2003;30(8):661–3.
7. Wolff H, et al. *Chlamydia trachomatis* prevalence in undocumented migrants undergoing voluntary termination of pregnancy: a prospective cohort study. BMC Public Health. 2008;8:391.
8. Wolff H, et al. Social inequalities and health: experiences of a mobile health care unit in Geneva. Rev Med Suisse. 2005; 1(34):2218–22.
9. Wolff H, et al. Undocumented migrants lack access to pregnancy care and prevention. BMC Public Health. 2008;8:93.
10. Wolff H, et al. Health care and illegality: a survey of undocumented pregnant migrants in Geneva. Soc Sci Med. 2005;60(9): 2149–54.
11. Baud D, et al. Low prevalence of *Chlamydia trachomatis* infection in asymptomatic young Swiss men. BMC Infect Dis. 2008;8:45.
12. ANAES. Place des techniques de biologie moléculaire dans l'identification des infections urogénitales basses à C. trachomatis. 2008. Available at: http://www.has-sante.fr/portail/upload/docs/application/pdf/Chlamydia_tome1_rap.pdf. Accessed 15 May 2009.
13. Cook RL, et al. Screening for *Chlamydia trachomatis* infection in college women with a polymerase chain reaction assay. Clin Infect Dis. 1999;28(5):1002–7.
14. Gaydos CA, et al. *Chlamydia trachomatis* infections in female military recruits. N Engl J Med. 1998;339(11):739–44.
15. Stergachis A, et al. Selective screening for *Chlamydia trachomatis* infection in a primary care population of women. Am J Epidemiol. 1993;138(3):143–53.
16. Besson M, et al. Self-medication amongst illegal Latino-American immigrants: necessary or inapropriate. Rev Med Suisse. 2007; 3(127):2239–43.
17. Phillips RS, et al. *Chlamydia trachomatis* cervical infection in women seeking routine gynecologic care: criteria for selective testing. Am J Med. 1989;86(5):515–20.
18. Datta SD, et al. Gonorrhea and chlamydia in the United States among persons 14 to 39 years of age, 1999 to 2002. Ann Intern Med. 2007;147(2):89–96.
19. van den Hoek JA et al. [Opportunistic screening for genital infections with *Chlamydia trachomatis* among the sexually active population of Amsterdam. II Over 90% participation and almost 5% prevalence]. Ned Tijdschr Geneeskd. 1999;143(13):668–72.
20. Neu NM, et al. Genital chlamydial disease in an urban, primarily Hispanic, family planning clinic. Sex Transm Dis. 1998;25(6): 317–21.
21. Kahn RH, et al. Community-based screening and treatment for STDs: results from a mobile clinic initiative. Sex Transm Dis. 2003;30(8):654–8.
22. Expert commission on undocumented workers in Geneva. Geneva Department of Economy. Geneva. 2004:40–50. Available at http://www.sit-syndicat.ch/spip/IMG/pdf/_Sans_papiers_2004-11_-_rapport_commission_experts.pdf. Accessed on 4 June 2009.
23. Bzostek S, et al. Why do Hispanics in the US report poor health? Soc Sci Med. 2007;65(5):990–1003.
24. Gunn RA, et al. *Chlamydia trachomatis* infection among Hispanic women in the California-Mexico border area, 1993: establishing screening criteria in a primary care setting. Sex Transm Dis. 1995;22(6):329–34.
25. Oliveira FA, et al. Sexually transmitted infections, bacterial vaginosis, and candidiasis in women of reproductive age in rural Northeast Brazil: a population-based study. Mem Inst Oswaldo Cruz. 2007;102(6):751–6.